REMARKS

Claims 1-28 are pending with Claims 1-8 being independent. Claims 5-8 are withdrawn from consideration, leaving Claims 1-4 and 9-28 open for prosecution with Claims 1-4 being independent.

A. 35 U.S.C. § 103 REJECTIONS OVER OKADA IN VIEW OF XIE

Claims 1-4 and 9-24 are rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent Application Publication No. 2002/0055014 A1 to Okada et al. ("*Okada*") in view of U.S. Patent Application Publication No. 2003/0215667 A1 to Xie ("*Xie*").

Applicant respectfully traverses these rejections.

In its recent opinion in *KSR Int'l Co. v. Teleflex, Inc.*, 127 S.ct. 1727 (2007), the Supreme Court reaffirmed the *Graham* factors in the determination of obviousness under § 103. *KSR Int'l*, 127 S.Ct. at 1734. The four factual inquiries under *Graham* are:

(a) determining the scope and content of the prior art;

(b) ascertaining the differences between the prior art and the claims in issue;

(c) resolving the level of ordinary skill in the pertinent art; and

(d) evaluating evidence of secondary consideration.

Id. (quoting *Graham v. John Deere*, 383 U.S. 1, 17-18, 148 U.S.P.Q. 459, 467 (1966)).

The Supreme Court further noted the obviousness analysis under § 103 should be explicit, and that it was "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. The Court expressly held:

> Often, it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an ***apparent reason*** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis ***should be made explicit***.

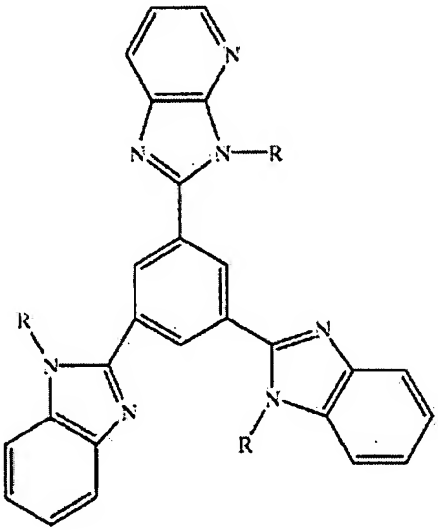
KSR Int'l, 127 S.Ct. at 1240-41 (emphasis added). Accordingly, when rejecting a claim based

upon a combination of prior art references, it remains necessary to identify the reason why a person of ordinary skill in the art of the patent would have combined the prior art elements in the manner claimed.

Moreover, there must be a reasonable expectation of success when combining these references, which reasonable expectation must be found in the prior art and not based upon applicant's disclosure. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See* M.P.E.P. 706.02(j); *see also In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

1. The prior art does not teach or suggest all the claim limitations

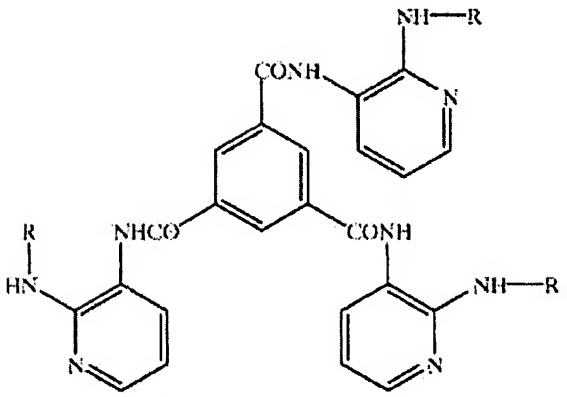
The Examiner states: "Okada et al. discloses as the heterocyclic compound the following compound with regard to the present 'host compound':



246 (R = phenyl)
247 (R = 3-methyl phenyl)
248 (R = 4-tert-butylphenyl)
291 (R = 2-methylphenyl)
294 (R = 8-quinolyl)

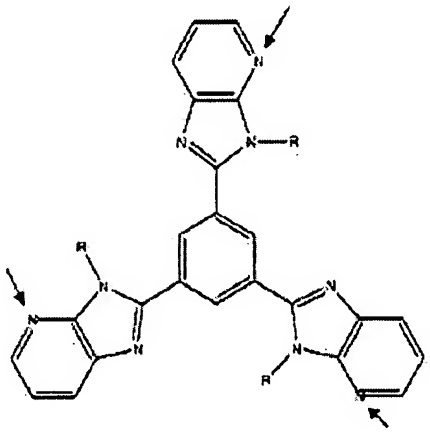
(see page 70, second column)." Final Office Action, at 3.

Applicants note, however, that this structure appears to be in error. In the prior step in the synthesis in paragraph [0128] of *Okada*, the intermediate is depicted as:



246b (R = phenyl)
247b (R = 3-methyl phenyl)
248b (R = 4-tert-butylphenyl)
291b (R = 2-methylphenyl)
294b (R = 8-quinolyl)

This structure includes three –CONH groups and three –NH groups. Each of the CONH and –NH pairs is dehydrated and cyclized. This reaction would yield the following structure:



not the structure depicted by *Okada* (page 70, second column), which omits two of the three nitrogens indicated by arrows in the structure above. Thus, the structure depicted by *Okada* is in error. The correct structure in *Okada* does ***not*** include a benzimidazole skeleton, as required by Independent Claims 1-4, and *Xie* does not cure this deficiency.

2. There is no motivation to combine references

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). *See* M.P.E.P. § 2143.01.III. (emphasis in original). A fundamental reason the patent laws require examiners to show motivation to combine the references that create the case of obviousness and to show that there is a reasonable expectation of success taught or suggested by these references is to prevent the use of hindsight reasoning. *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998).

The Examiner admits: "Okada fails to teach specifically the coumarin derivative species under consideration." Final Office Action, at 3. The Examiner further states: "Xie teaches in analogous art coumarin derivatives useful as dopants in the luminescent layer of an electroluminescent device (see abstract)." *Id.*

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. The Examiner has failed to consider the references in their entirety. The differences between the molecular processes involved in phosphorescence and fluorescence are well known. The fact that *Okada* requires a phosphorescent compound in the light emitting layer, while *Xie* teaches advantages of fluorescent compounds, constitutes a mutual teaching away. Motivation to combine the cited art simply does not exist.

Okada discloses:

> A light emitting device comprising a pair of electrodes formed on a substrate, and organic compound layers comprising a light-emitting layer provided in between the electrodes, wherein at least one of the organic compound layers comprises a heterocyclic compound having at least two hetero atoms and a ***phosphorescent compound***."

Okada, Abstract (emphasis added).

Okada further discloses:

> The phosphorescent compound which can be used in the present invention is defined to be a substance which emits light resulting from the transition between states of different multiplicity, typically between the lowest excited triplet state and the singlet ground state, more intensely than others. It is preferable to use a phosphorescent compound having a phosphorescence quantum yield at room temperature of at least 25%, preferably 40% or more, still preferably 60% or more, particularly preferably 80% or more. Such phosphorescent compounds include metal-free organic compounds, metal complexes having a metal-hetero atom bond, and organometal complexes having a metal-carbon bond. In particular, ortho-metalated metal complexes are preferred.

Okada, para. [0192].

Regarding the light-emitting layer, *Okada* states:

> While the light-emitting layer preferably contains the aforementioned ortho-metalated metal complex, it can also comprise other light-emitting materials. ***Useful light-emitting materials other than the ortho-metalated metal complex include various metal complexes, typically metal complexes or rare-earth element complexes of*** benzoxazole, benzimidazole, benzothiazole, styrylbenzene, polyphenyl, diphenylbutadiene, tetraphenylbutadiene, naphthalimide, ***coumarin***...

Okada, para. [0223] (emphasis added).

Xie discloses "compositions and electroluminescent (EL) devices that have enhanced performance as a result of a novel class of anthracene derivatives used as host materials for a full range of color dopands. When using coumarin derivatives as color dopands in the anthracene derivatives in an EL device, the device performs a desirable light emitting efficiency and durability." *Xie*, Abstract.

Xie further discloses: "The novel anthracene derivatives of this invention have sufficiently large bandgaps for effective energy transfer with a range of commonly available fluorescent dyes as dopants. Examples of such blue dopants include arylamines, coumarins...." *Xie*, para. [0073]. Coumarin derivatives in accordance with the invention are illustrated in paragraphs [0081] – [0085].

In contrast to *Okada*, *Xie* does not teach or suggest metal complexes or rare-earth element complexes of coumarins. Furthermore, *Xie* states: "It is an advantage of the present invention,

that the organic electroluminescent (EL) element, which belongs to anthracene, coumarine and benazole derivatives, or their combinations, provides thermally stable, glassy, and highly fluorescent materials in condensed thin films. As a result, organic EL devices employing certain of these derivatives in the light-emitting layer can produce full range of emission spectra and long operational stability." *Xie*, para. [0037].

Thus, *Okada* teaches that the light emitting layer includes a phosphorescent compound. *Okada* further teaches that light-emitting materials include metal complexes or rare-earth element complexes of coumarin. In contrast, *Xie* teaches highly fluorescent materials in condensed thin films. *Xie* does not teach or suggest metal complexes or rare-earth element complexes of coumarin. As such, the Examiner has failed to consider *Okada* and *Xie* in their entirety, including portions that would lead away from the claimed invention.

3. There is no reasonable expectation of success

Because of the different processes involved in fluorescence and phosphorescence, the decay time of emitted light for fluorescent and phosphorescent compounds differs by orders of magnitude. Combining the metal-free dopants of *Xie* with the light emitting layer of *Okada*—when Okada specifically teaches phosphorescent metal complexes or rare-earth element complexes of coumarin—would change the principle of operation of the *Okada* device and/or render the *Okada* device unsatisfactory for its intended purpose, leaving no reasonable expectation of success.

4. Impermissible hindsight reasoning has been used

It is well settled that the claims cannot be used in hindsight as a template to reconstruct the invention willy-nilly by picking and choosing elements at will from prior art. *Procter & Gamble Co. v. Paragon Trade Brands, Inc.*, 989 F. Supp. 547, 587 (D. Del. 1997); *In re Gorman*, 933 F.2d 982, 987, 18 U.S.P.Q.2d 1885 (Fed. Cir.1991). Given the disparate compound classes cited by *Okada* and *Xie*, along with the wide variety of coumarins available and the lack of prioritization and/or selection criteria in the cited art, the Examiner has unquestionably used impermissible hindsight reasoning in combining the host material of *Okada* and the guest material of *Xie*.

Okada discloses ***rare-earth element complexes*** of a wide variety of compounds, including coumarins:

> Useful light emitting materials. . . . include various metal complexes, typically metal complexes or rare-earth element complexes of benzoxazole, benzimidazole, benzothiazole, styrylbenzene, polyphenyl, diphenylbutadiene, tetraphenylbutadiene, naphthalimide, coumarin, perylene, perinone, oxadiazole, aldazine, pyraridine, cyclopentadiene, bisstyrylanthracene, quinacridone, pyrrolopyridine, thiadiazolopyridine, styrylamine or derivatives of these compounds, aromatic dimethylidyne compounds, 8-quinolinol or derivatives thereof; and polymeric compounds, such as polythiophene, polyphenylene, polyphenylenevinylene, polythienylenevinylene.

Okada, paragraph [0223]

However, *Okada* provides no prioritization or selection criteria among the large and varied group of disparate compound classes, and the cited art provides no motivation to modify the *Okada* invention by specifically selecting a coumarin structure from this large group of disclosed compound classes, and further, to seek out a particular species of such a structure, *i.e.*, as disclosed by *Xie*. As evidence, Applicants have included Attachments A and B.

Attachment A lists coumarin products from the Sigma-Aldrich Co. website (©2007). Out of the 100 coumarins available from Aldrich-Sigma, not one of these structures includes a benzimidazole skeleton.

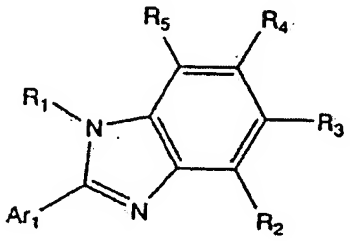
Attachment B lists SciFinder (©2007 American Chemical Society) search results for "coumarin" and "electroluminescence." Of the 53 structures listed, not one of the structures includes a benzimidazole skeleton.

These two relevant and often relied upon sources indicate background knowledge possessed by a person having ordinary skill in the art. The absence of any coumarin with a benzimidazole skeleton in these two attachments further emphasizes the lack of an apparent reason to combine the elements as indicated by the Examiner. In addition, the Examiner has failed its duty to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed.

5. The claimed combination of elements yields unexpected results

Independent Claim 1 recites in part: "wherein each of said host material and said guest material is a compound having a skeleton represented by the general formula 1:

Formula 1

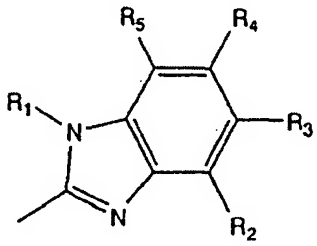


. . . (1)

...."

Independent Claim 2 recites in part: "wherein at least one substituent out of substituents X_1 to X_6 represented by the general formula 2 [host] and a substituent X_1 represented by the general formula 3 [guest] have an imidazole skeleton represented by the general formula 4:

Formula 4

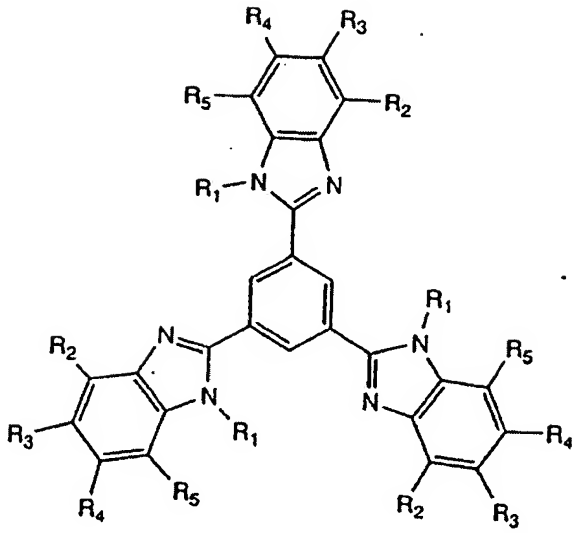


. . . (4)

...."

Independent Claim 3 recites in part: "wherein said host material is a compound represented by the general formula 5:

Formula 5

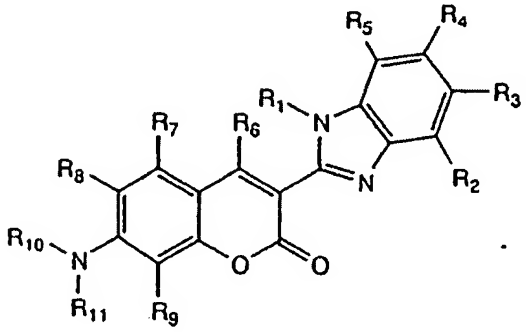


. . . (5)

...

wherein said guest material is a compound represented by the general formula 6:

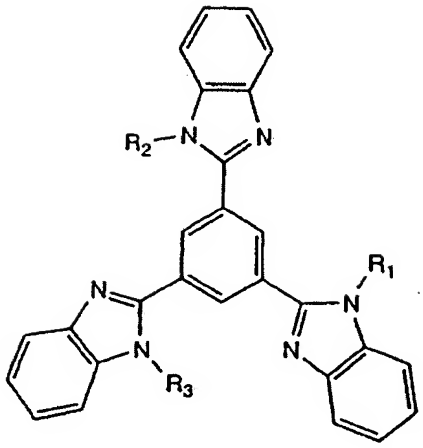
Formula 6



...."

Independent Claim 4 recites in part: "wherein said host material is a compound having a skeleton represented by the general formula 7:

Formula 7

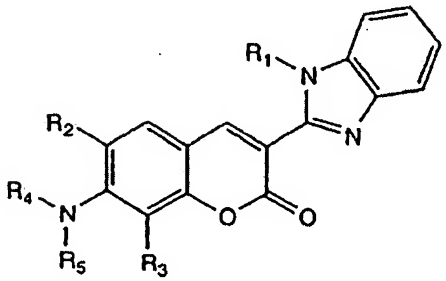


. . . (7)

...

wherein said guest material is a compound having a skeleton represented by the general formula 8:

Formula 8



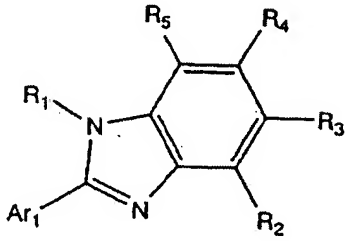
. . . (8)

...."

Thus, independent Claims 1-4 all require a host material and a guest material in an electroluminescent layer to have a chemical structure that includes a benzimidazole skeleton.

The Application states: "[a]ccording to the present invention, device characteristics (luminous efficiency, luminous characteristics, or the like) of an electroluminescent element is improved by using host materials and guest materials which have a common skeleton

(represented by the following general formula 1) for an electroluminescent layer interposed between a pair of electrodes in the electroluminescent layer.



. . . (1)

"

Application, abstract.

The Examiner states: "Okada clearly teaches coumarin derivatives and applicant has provided no data showing unexpectedly improved results using the specific coumarin derivatives over any other non-claimed coumarin derivatives or other light emitting materials listed by Okada. In the absence of unexpected results, the rejections are respectfully maintained." Final Office Action, at 6.

The combination of the cited art does not teach or suggest an electroluminescent device in which the host material and the guest material both have a common benzimidazole skeleton. Furthermore, Comparative Example 1, along with Example 4 and FIGS. 7-10 in the Application, provide data showing unexpected improvement using host and guest materials with a common benzimidazole skeleton. U.S. Patent Application Publication No. 2004/0209119, paragraphs [0103] – [0115], and FIGS. 7-10.

Comparing Comparative Example 1, for which the host and guest materials ***do not*** have a common structure, with Example 2, for which the host and guest materials ***do*** have a common structure, the Application states:

> The result provides the fact that the luminance to an applied voltage is significantly decreased compared with that of the device configuration shown in Example 2.

Id., para. [0113].

> Also in this case the current efficiency is worse than that represented by plot 2 of the device configuration shown in Example 2.

Id., para. [0114].

> The current-voltage characteristics plot 1 in FIG. 10 shows that current flow is only approximately 0.02 mA at an applied voltage of 7 V.

Id., para. [0115].

> From the comparative results described above, the device configuration can be improved by forming the electroluminescent element using host materials and guest materials which have a common skeleton according to the invention.

Id., para. [0116].

Thus, Comparative Example 1 provides evidence of unexpected results using the claimed combination of guest materials (coumarin derivatives) and host materials with benzimidazole skeletons.

For each of the reasons in Sections A.1 – A.5, *prima facie* obviousness has not been not established. As such, independent Claims 1-4, and Claims 9-24 dependent therefrom, are patentable over *Okada* in view of *Xie*. Applicants respectfully request removal of the 35 U.S.C. § 103(a) rejections of Claims 1-4 and 9-24.

B. 35 U.S.C. § 103 REJECTIONS OVER OKADA IN VIEW OF XIE AND KAWAMI

Claims 25-28 are rejected under 35 U.S.C. § 103(a) as unpatentable over *Okada* in view of *Xie* and U.S. Patent No. 5,929,561 to Kawami et al. ("*Kawami*").

Applicant respectfully traverses these rejections.

For each of the reasons in Sections A.1 – A.5, *prima facie* obviousness has not been not established for independent Claims 1-4. Furthermore, *Kawami* does not remedy the failure of the combination of *Okada* and *Xie* to describe or suggest the subject matter of the independent claims. As such, Claims 25-28 dependent therefrom, are patentable over *Okada* in view of *Xie* and *Kawami*. Applicants respectfully request removal of the 35 U.S.C. § 103(a) rejections of Claims 25-28.

C. CONCLUSIONS

Applicants submit that all claims are in condition for allowance.

The fees for a request for continued examination and a one-month extension of time are being paid concurrently herewith on the Electronic Filing System (EFS) by way of Deposit

Account authorization. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: October 29, 2007

Heather L. Flanagan, Ph.D.
Reg. No. 54,101

Fish & Richardson P.C.
One Congress Plaza
Suite 810
111 Congress Avenue
Austin, TX 78701
Telephone: (512) 472-5070
Facsimile: (512) 320-8935

11030322.doc